



Building a Practical Digital Twin to Address Public Awareness of Sewage Pollution Legislation

NEWEA 2023 Annual Conference & Exhibit | Rajan Ray, Trinnex

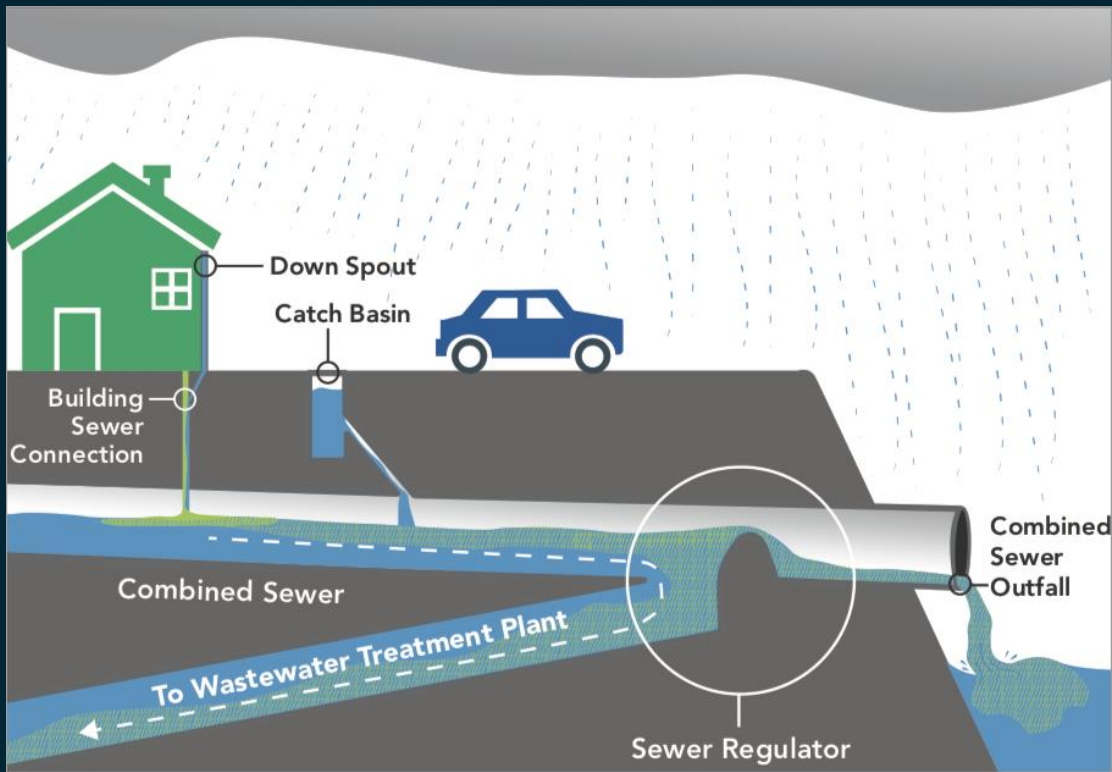


Thanks to the Forward-Thinking Team at New Bedford

- Jamie Ponte, Commissioner
- Shawn Syde, City Engineer
- Jim Costa, Superintendent
- Justin Chicca, Deputy Commissioner



Combined Sewer Overflows are a priority water pollution concern for ~700 municipalities across the U.S



<https://www.nyc.gov/site/dep/water/combined-sewer-overflows.page>



Sewer overflows are challenging on multiple levels from costly fines to impacting public trust



Costly fines

Fines and expensive measures to address fixes



Environment & social impacts

From fisheries to community recreational activities



Bad press

Public confidence and impact on utility brand



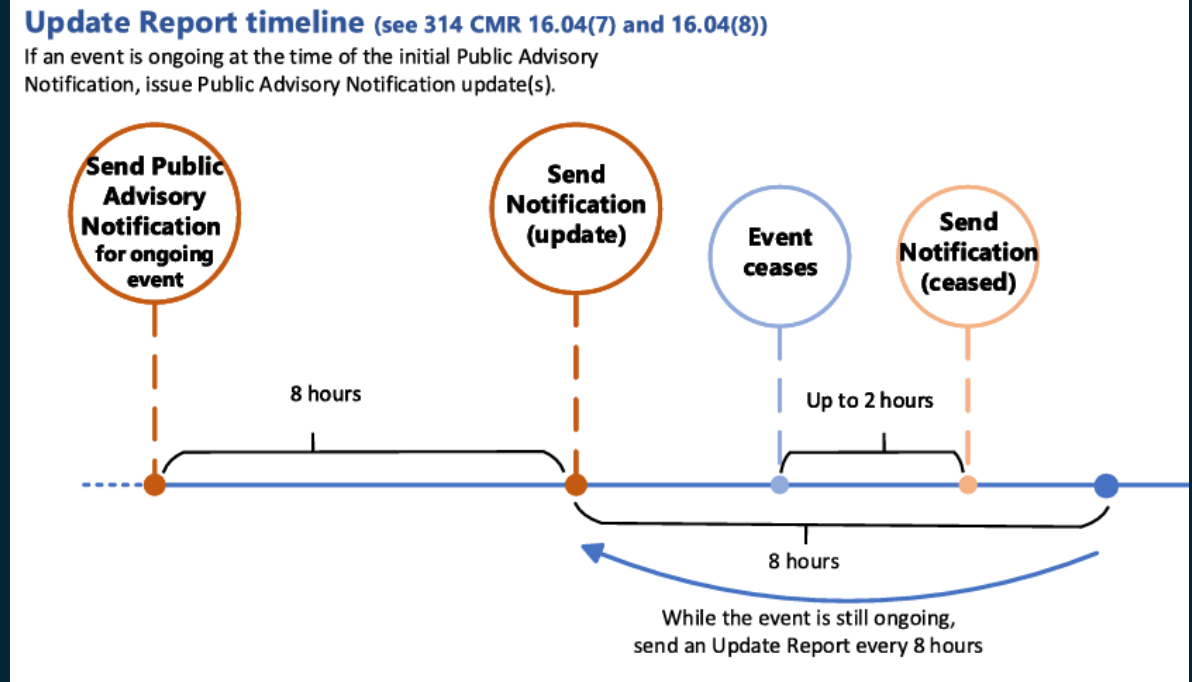
314 CMR 16.00: An Act Promoting Awareness of Sewage Pollution in Public Water

- Effective on July 6, 2022
- Permittees must issue public advisory notifications when there is a discharge from their outfalls that consists of untreated sewage and waste.
- Includes combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and blended wastewater.

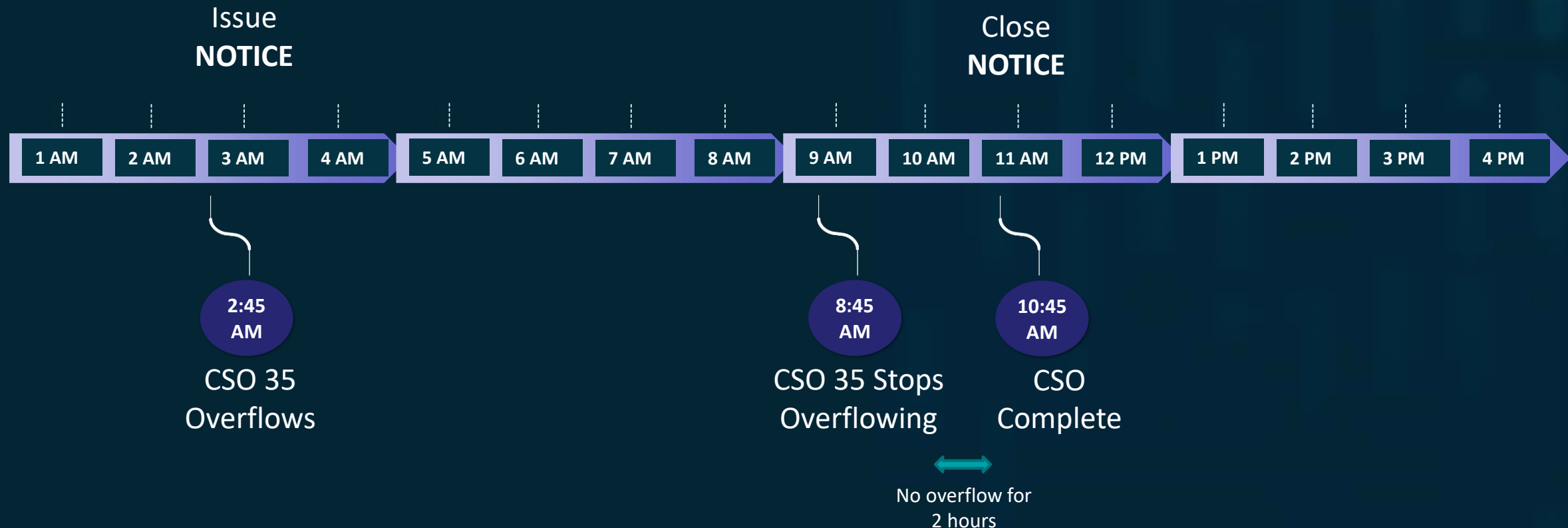


CSO Reporting Requirements

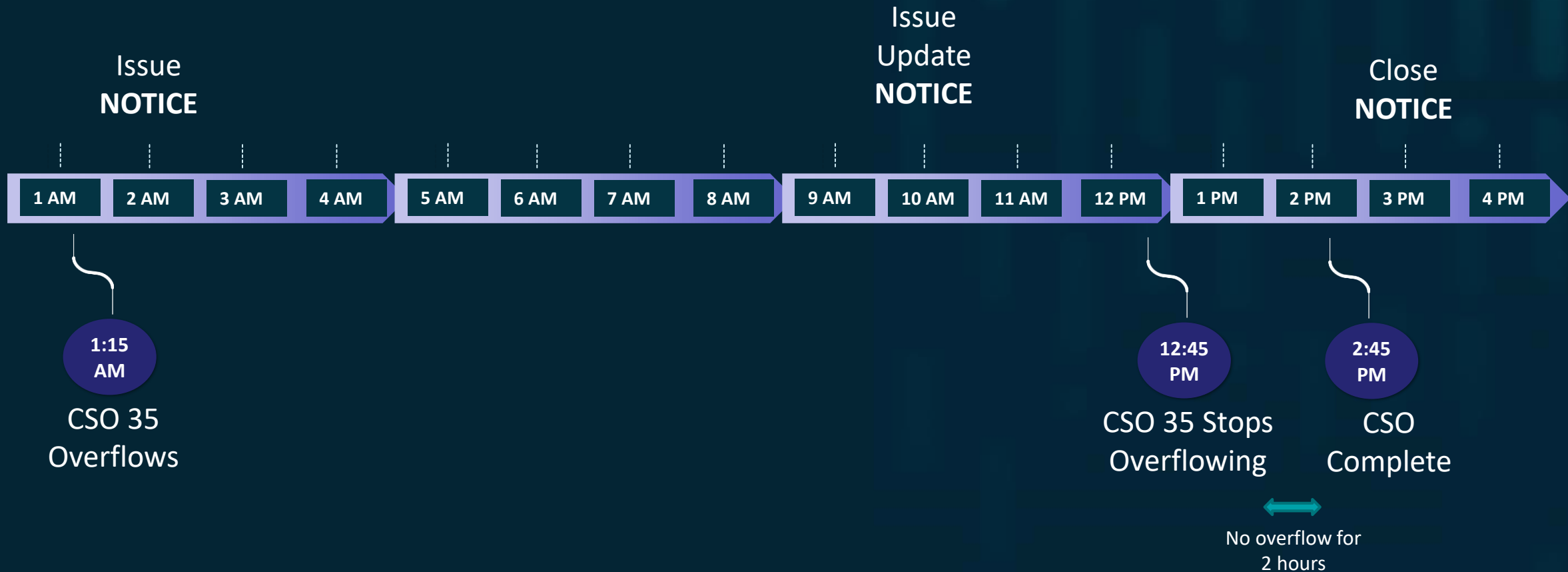
- Public Notification 2 hours after discovery of CSOs
- Ongoing updates every 8 hours if event has not ended
- Event completion update 2 hours after event ends
- Submittal on DEP website 18 hours after initial notification



Example: The dreaded 3am event (an overflow lasting < 8 hours)

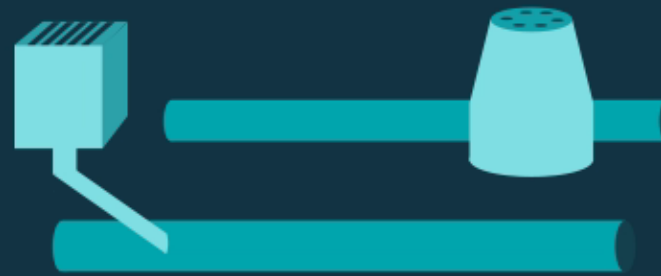


Example 2: Event lasting greater than 8 hours

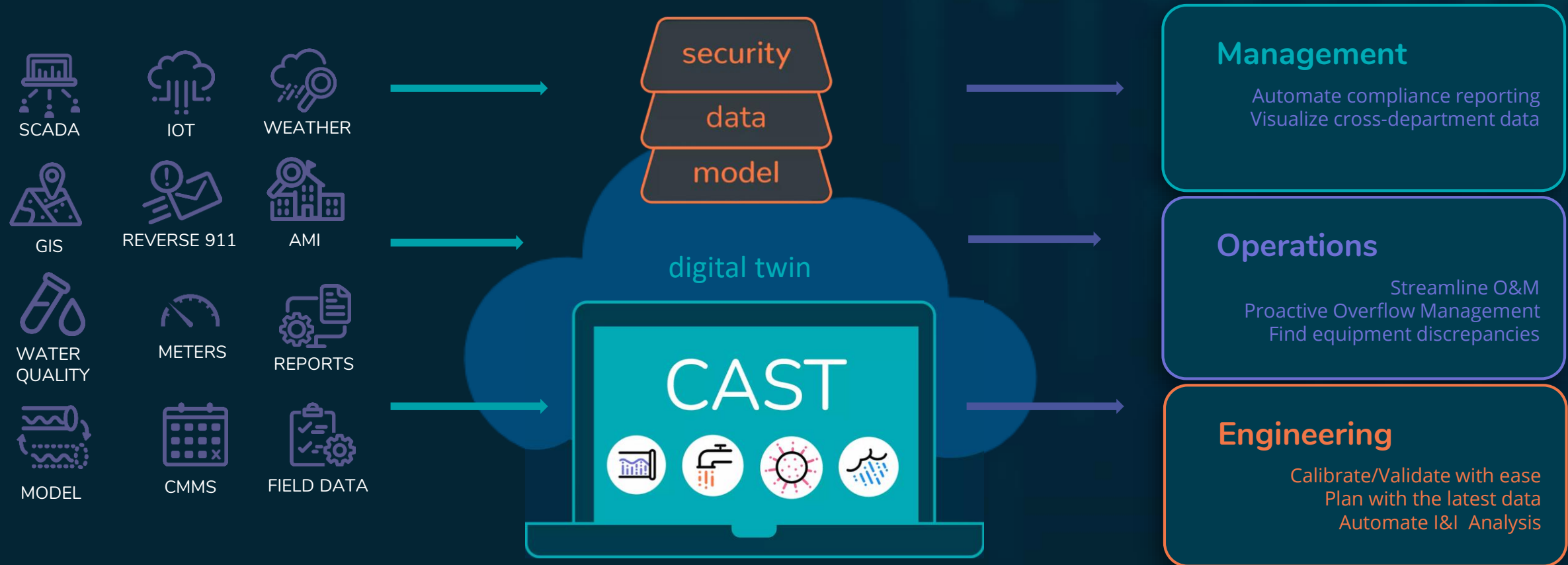


Quick diversion: what is a digital twin?

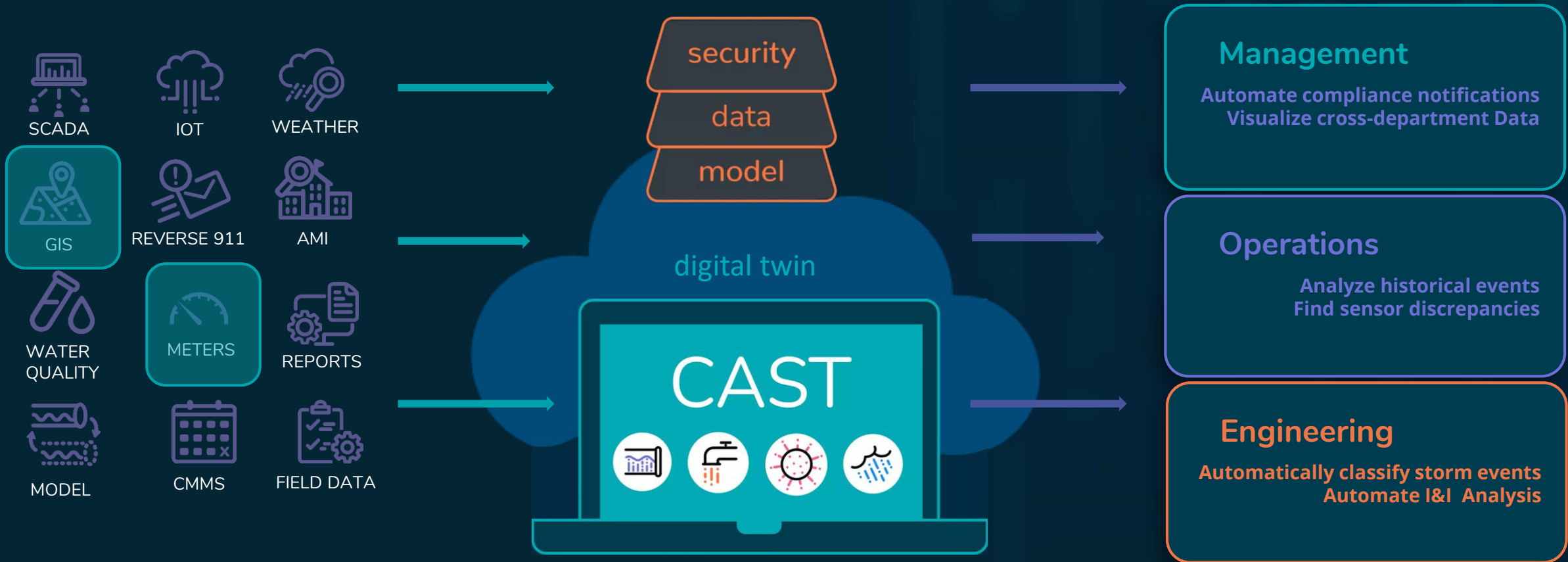
“A digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making.”



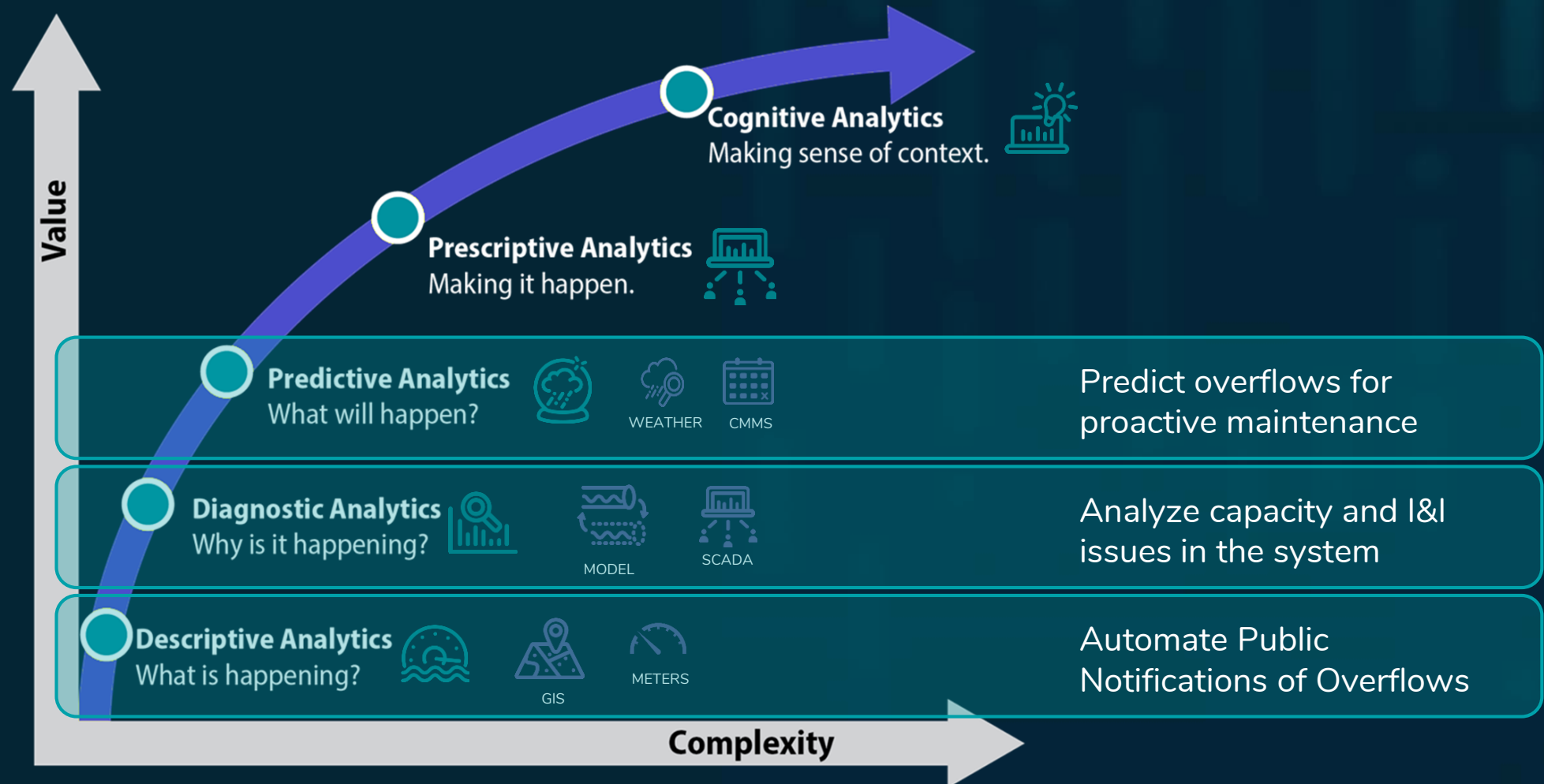
Leverage any existing IT infrastructure & data with digital twin to enable cross-functional teams



Utilities can start simple with just one or two data layers to address notification regulation

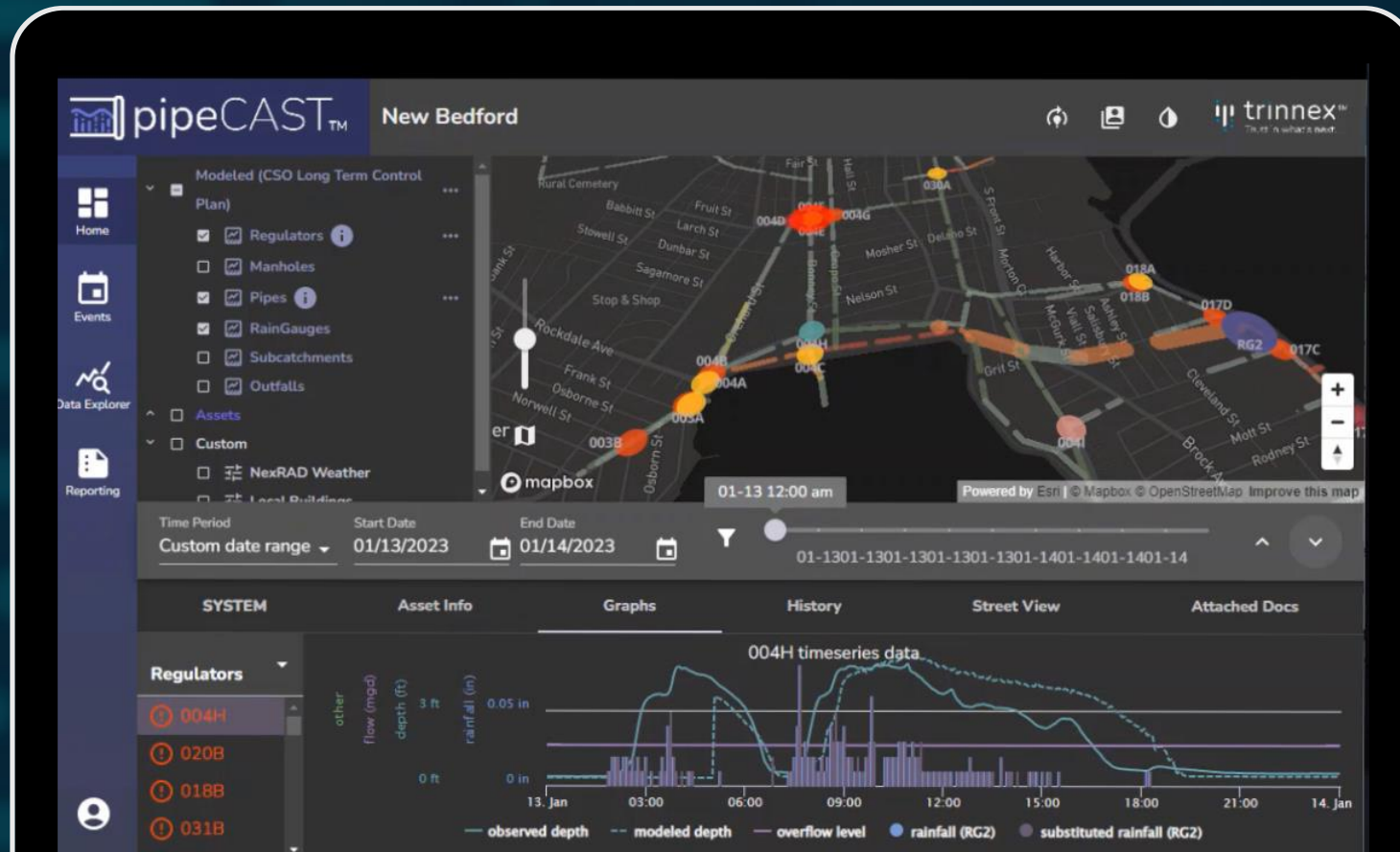


Where this public advisory notification fits in your digital transformation roadmap



pipeCAST™

Plug & Play Digital Twin for Sewer Systems



Case Study: City of New Bedford MA

- Population of 100,000
- Earliest sewers date back mid 19th century
- 254 miles of sewer pipe
- 72 CSO Regulators
- 27 CSO Outfalls



New Bedford automated overflow notifications via pipeCAST



Public Infrastructure Page

EXISTING COLLECTION SYSTEM COMPONENTS

CSO DISCHARGE TABLE

Reporting Meter	Code	Called Location	Reporting Method	Start Time	End Time	Duration	Volume (gallons)	Event Severity (checked)
Clark Creek	805	Clark Creek Parkway St	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	8,547	<input checked="" type="checkbox"/>
Irish Harbor	603	Callahan and Franklin Ave	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	1,337	<input type="checkbox"/>
Irish Harbor	602	Seaver St and Ho. Point St	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	1,337	<input type="checkbox"/>
Irish Harbor	606/6	Seaver St and Ho. Point St	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	1,337	<input type="checkbox"/>
Irish Harbor	601	Irish Harbor Park Dr	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	1,337	<input type="checkbox"/>
Irish Harbor	607	Irish Harbor Park Dr	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	1,337	<input type="checkbox"/>
Clark Creek	806	Clark St and Clark St	Sewer	10/30/2022 07:46:00 EST	10/30/2022 08:56:00 EST	1:10	8,547	<input type="checkbox"/>



Send OnSolve emails

- Reverse 911 automated via pipeCAST API
- Multilingual

Massachusetts Department of Environmental Protection
Division of Water Resources - Combined Sewer Overflow (CSO) Public Notification Program
Combined Sewer Overflow Final Public Notification Plan

1. Facility Information

2. Identification of Environmental Justice Populations

3. Discharges, Overflows, and Public Notification Content

Report to DEP

- Manual report
- Data from pipeCAST helps populate report

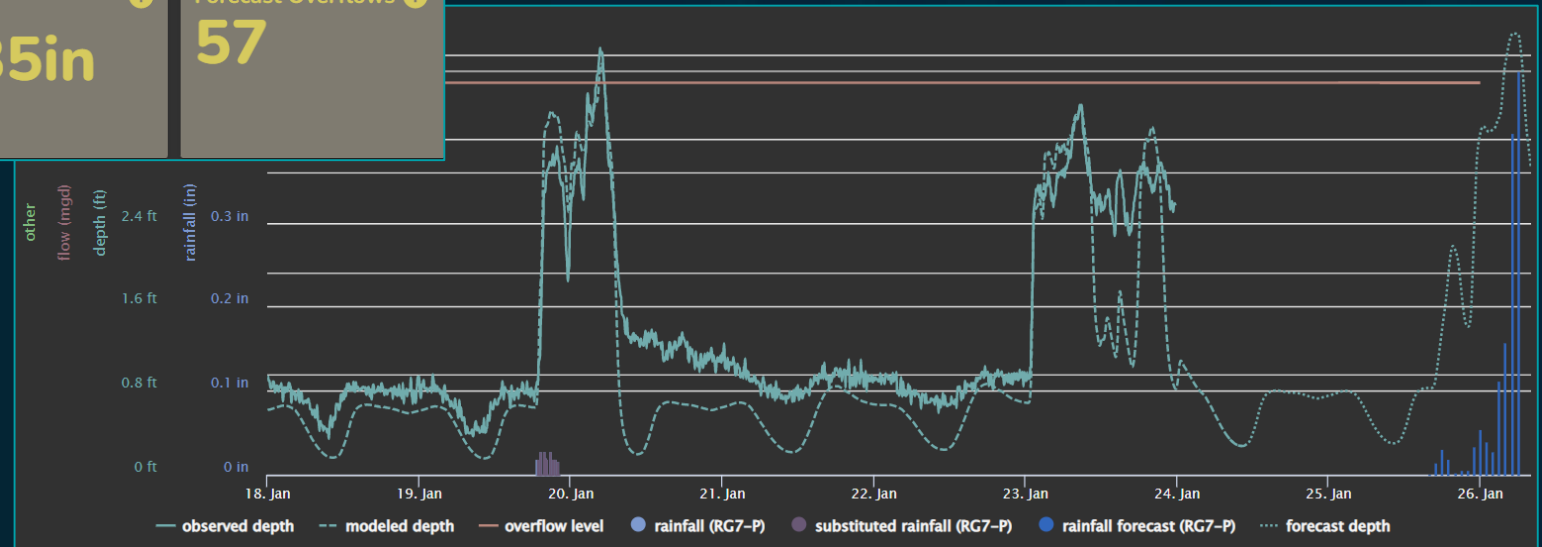
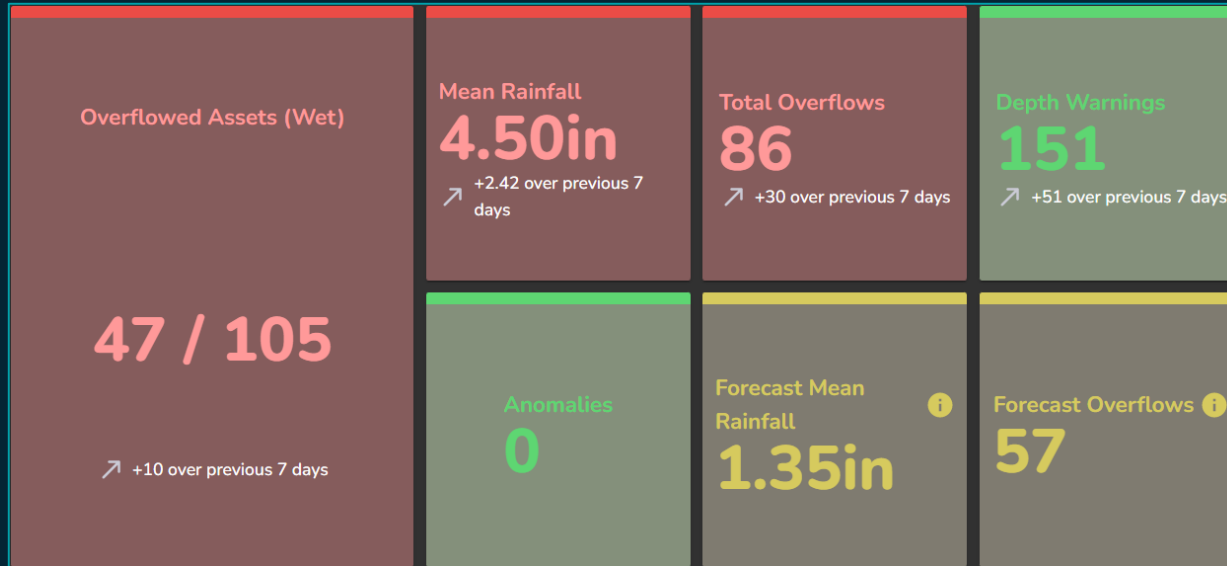
Daily Alerts

- Smart alerts based on pipeCAST calculations
- Immediately find anomalies and trouble spots

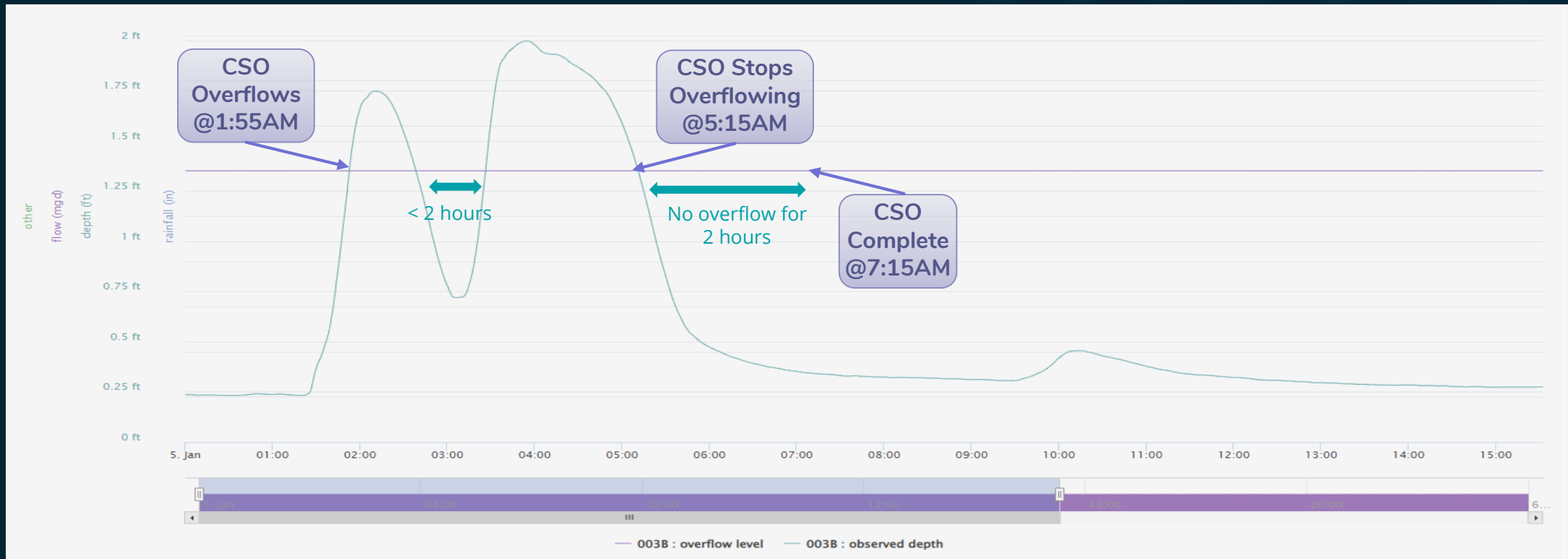
Update City Website

- Automatic updates with no human intervention
- Built-in validation

View rainfall, overflow depth, simulated results and forecasts in one view

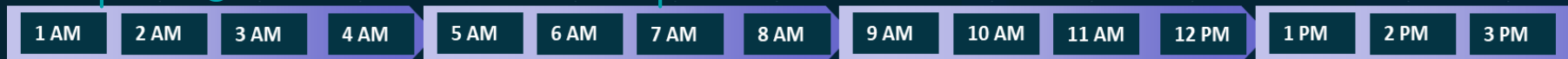


Easily visualize overflow durations in a single plot for any meter



Issue Notice @1:55am

Close Notice @7:15am



Meter data sent overflow alarm but pipeCAST corrected and prevented sending a false positive notification

5:47

Today 3:56 PM

New Bedford, MA - 003B High High Alarm at 01/06/2023 3:55:00 PM

Yesterday 10:57 PM

New Bedford, MA - 003B High Level Return To Normal at 01/05/2023 10:55:00 PM

Today 1:26 PM

New Bedford, MA - 003B High Level Alarm at 01/06/2023 1:25:00 PM

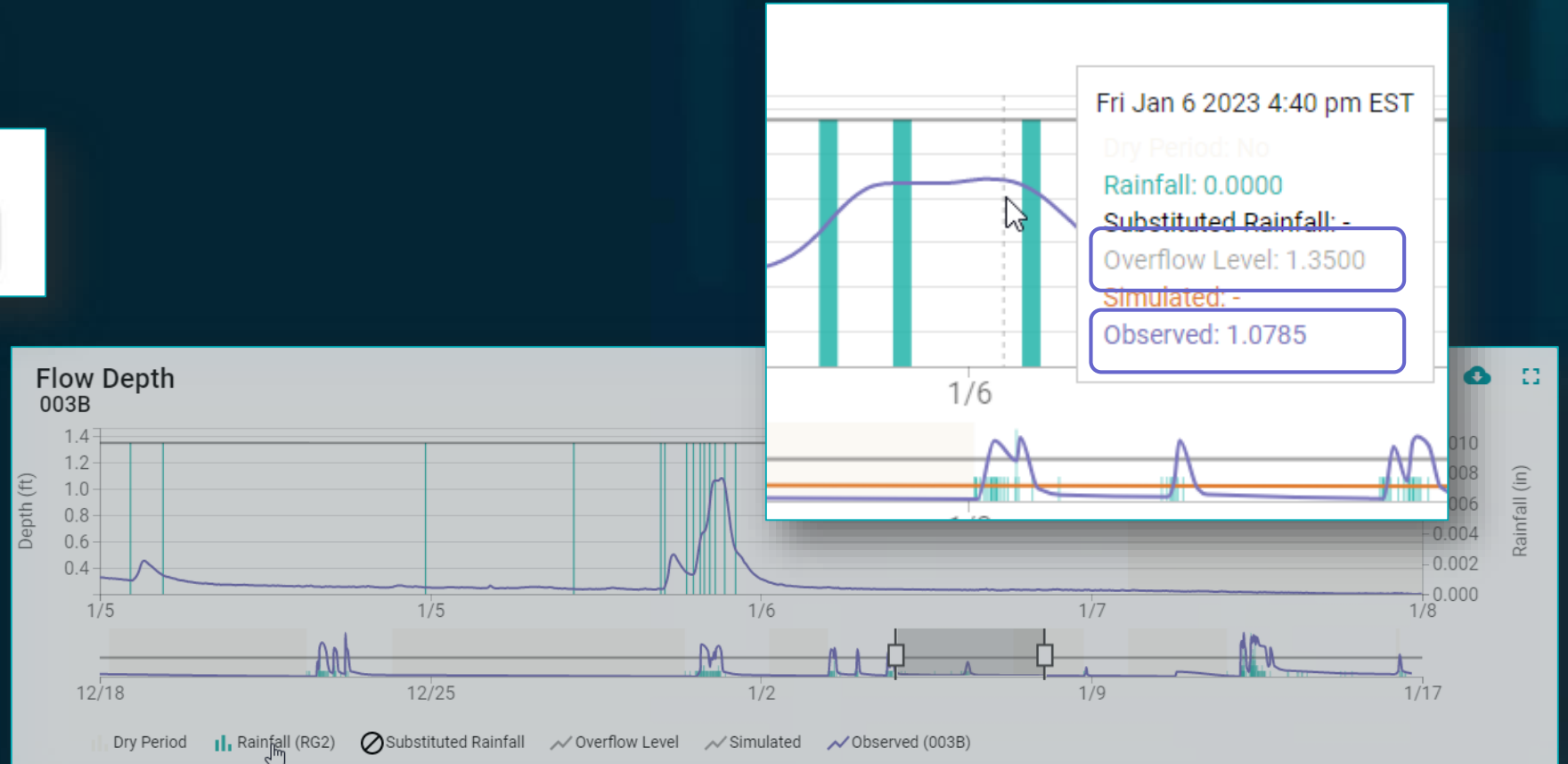
Today 3:56 PM

New Bedford, MA - 003B High High Alarm at 01/06/2023 3:55:00 PM

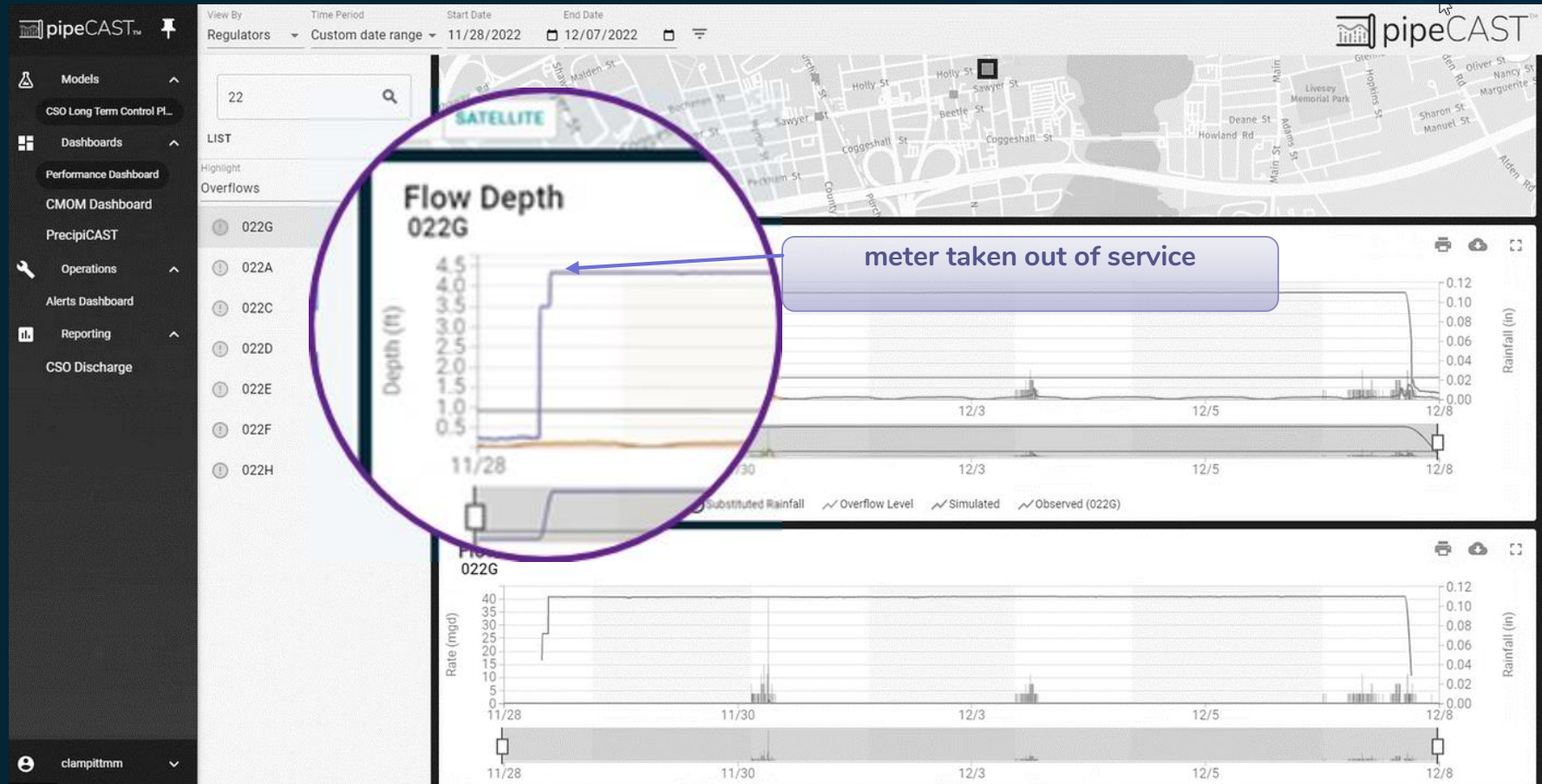
New Bedford, MA - 007A High Level Alarm at 01/06/2023 3:55:00 PM

Today 5:11 PM

New Bedford, MA - 003B High High Return To Normal at 01/06/2023 5:10:00 PM



One of the challenges is to be able to identify a maintenance activity vs an actual flooding event



Flexibility in pipeCAST's notification report (include, publish, add comments, etc.)

The screenshot displays the pipeCAST™ interface for 'New Bedford'. The top navigation bar includes the logo and the location name. Below this, a control panel allows users to filter data by 'Time Period', 'Start Date', and 'End Date'. The 'Time Period' dropdown menu is currently open, showing options such as 'Today with forecast', 'Past 7 days with forecast', 'Past 7 days', 'Past 30 days', 'Past 365 days', 'Year to date', and 'Custom date range'. The main content area shows a table of notification events with columns for 'Regulator', 'CSO Start', and 'CSO End'. The table is partially obscured by the dropdown menu.

Regulator	CSO Start	CSO End
031B	2023-01-12 21:50	2023-01-13 00:55
031B	2023-01-13 03:00	2023-01-13 10:50
031B	2023-01-13 10:25	2023-01-13 12:25
027E	2023-01-12 21:25	2023-01-13 00:00
027E	2023-01-13 02:55	2023-01-13 10:45
027E	2023-01-13 10:35	2023-01-13 10:45
023A	2023-01-12 21:05	2023-01-13 10:50



Seamless integration with City's website

The screenshot displays the City of New Bedford website interface. At the top, there are navigation links for various city departments: CITY OF NEW BEDFORD, DESTINATION NEW BEDFORD, ECONOMIC DEVELOPMENT COUNCIL, PORT OF NEW BEDFORD, and NEW BEDFORD CREATIVE. Below these are main navigation categories: RESIDENTS, BUSINESSES, VISITORS, CITY OFFICES, GOVERNMENT, LOCAL LINKS, MAPS, DIRECTIONS, CONTACT, and COVID-19. The main content area features the City of New Bedford logo with the tagline "lighting the way" and "new bedford". To the right of the logo is the text "PUBLIC INFRASTRUCTURE". A search bar is located in the bottom right of this section. Below the main content area is a horizontal menu with links: DEPT. HOME, CEMETERY, ENGINEERING, HIGHWAY, PARK MAINTENANCE, WATER, and WASTEWATER. The "WASTEWATER" link is highlighted. Below the menu is a breadcrumb trail: CITY OF NEW BEDFORD, MASSACHUSETTS > PUBLIC INFRASTRUCTURE > WASTEWATER > NEW BEDFORD CSO REPORT. The main content area is divided into two columns. The left column contains the heading "PUBLIC INFRASTRUCTURE" and two sub-sections: "LOCATED AT:" with the address "1105 Shawmut Avenue, New Bedford, MA 02746" and "PHONE NUMBERS" with the number "Tel: 508-979-1550". The right column contains the heading "CSO DISCHARGE TABLE" and a table with the following data:

Receiving Water	Outfall	Outfall Location	Reporting Method	Start Time	End Time	Duration	Volume (million gallons)	Event Rainfall (inches)
Outer Harbor	018	Cove St. and East Rodney	Sensor	01/12/2023 09:50 PM EST	01/13/2023 11:00 AM EST*	13.17*	3.13*	2.02*
		Clarks Cove		01/12/2023	01/12/2023 10:50			

*Record is provisional and may be updated



CSO Notifications, here are your options:



Manual Method

- Manual confirmation using overflow “blocks”
- Review meter data to approximate volume
- Rely on humans to provide updates/notices at all hours of the day



Use pipeCAST™

- Leverages existing data and tools
- pipeCAST's cloud platform, data solutions, and cybersecurity
- Plug-and-play with your data so implementation is days not months
- Solid step into a digital twin framework



Build Yourself/DIY

- Data Management
- API connections
- Custom code
- False positives
- Cybersecurity
- Customer Support



Distinguishing methods to validate and streamline notifications via pipeCAST



Use the hydraulic model to identify anomalies and verify overflows



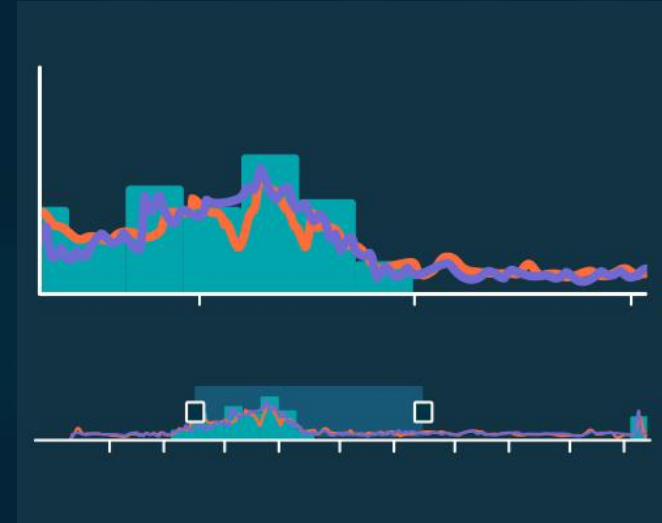
Integrate CMMS and disable a sensor if it is due for maintenance



Built-in validation rules to rule out false positives

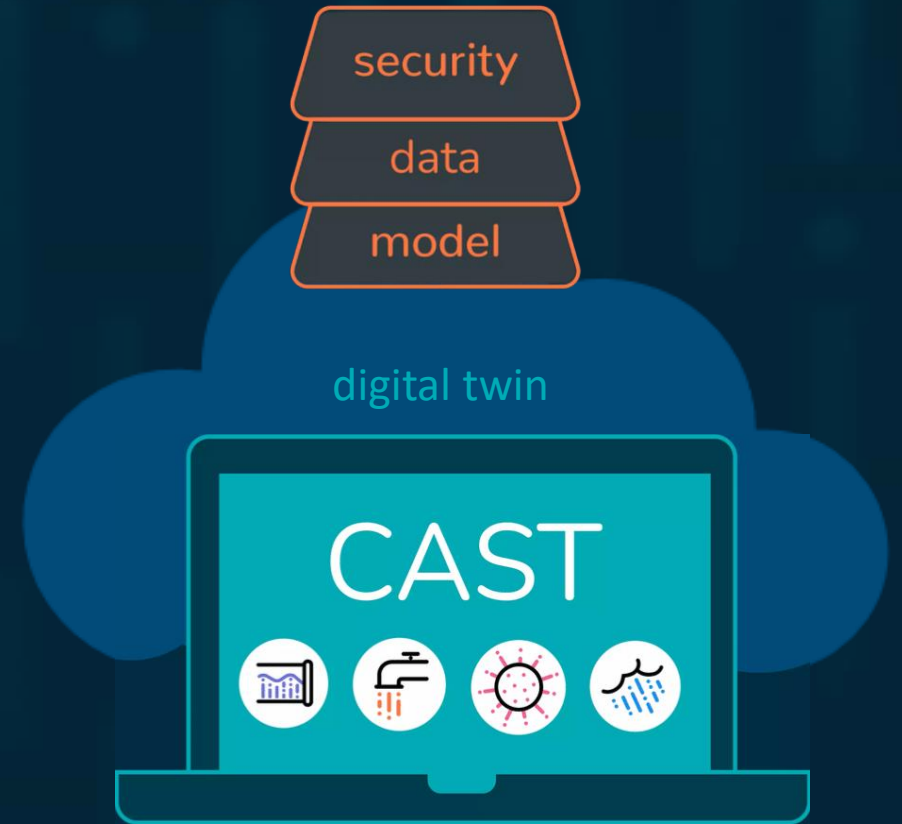


Forecast overflows to know what's coming and for proactive maintenance



Takeaways

- Finding a near-term win like automating overflow notification will start your utility on the digital transformation path
- Data and process for the notification regulation is complicated
 - False positives, sensor malfunctions, complex logic, custom integrations
- There are many ancillary benefits for automating overflow notifications
 - Validating equipment performance, cross-collaboration, etc.
- Maximizes existing IT & data investments
 - GIS, sensors, models, CMMS, etc.



Thank again to the fantastic team at New Bedford!



Plug & Play Digital Twin for Sewer Systems

Any questions?

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